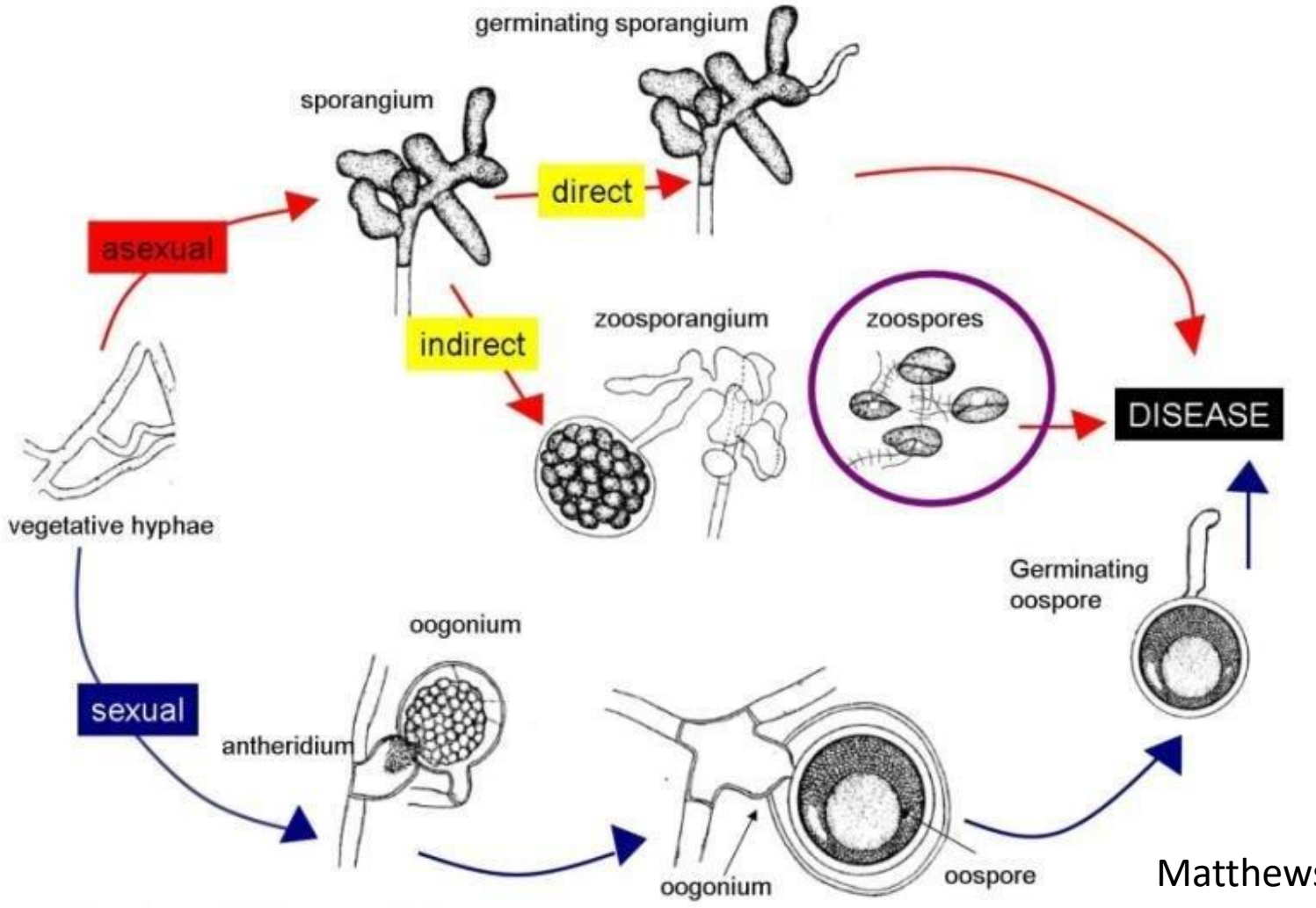
Pythium diseases in beans- new findings from 2021

Christian J. Cumagun
Parma Research and Extension Center
University of Idaho

Pythium – Class Oomycetes, water molds, not true fungi and causes seedling disease



Matthews, 1931

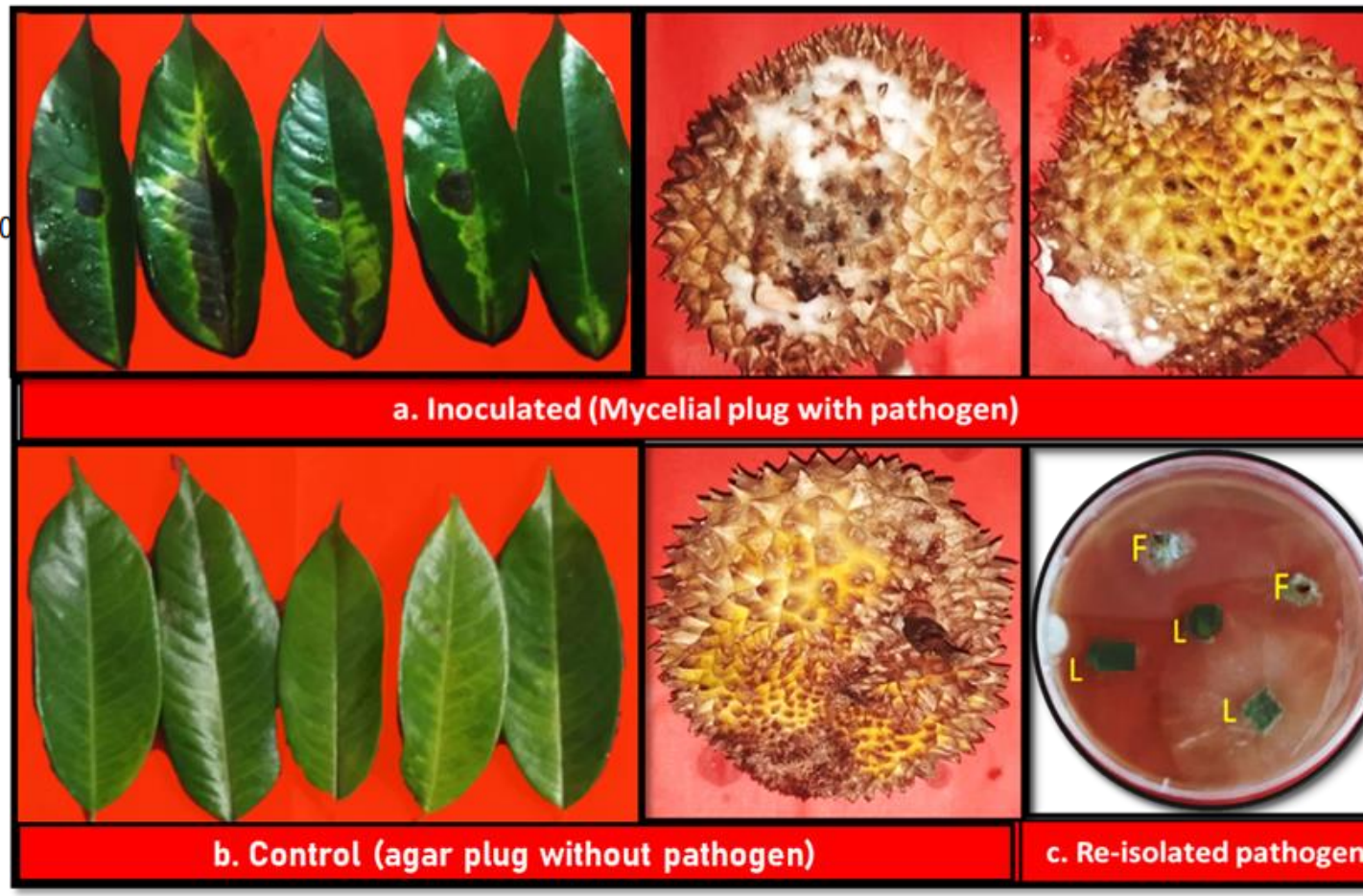
Journal of Plant Pathology (2021) 103:1085
https://doi.org/10.1007/s42161-021-00892-4

DISEASE NOTE

First report of *Pythium cucurbitacearum* causing fruit rot of durian in the Philippines

Tamie C. Solpot[1,2] · Christian Joseph R. Cumagun[2,3]

Received: 20 May 2020 / Accepted: 20 June 2021 / Published online: 30

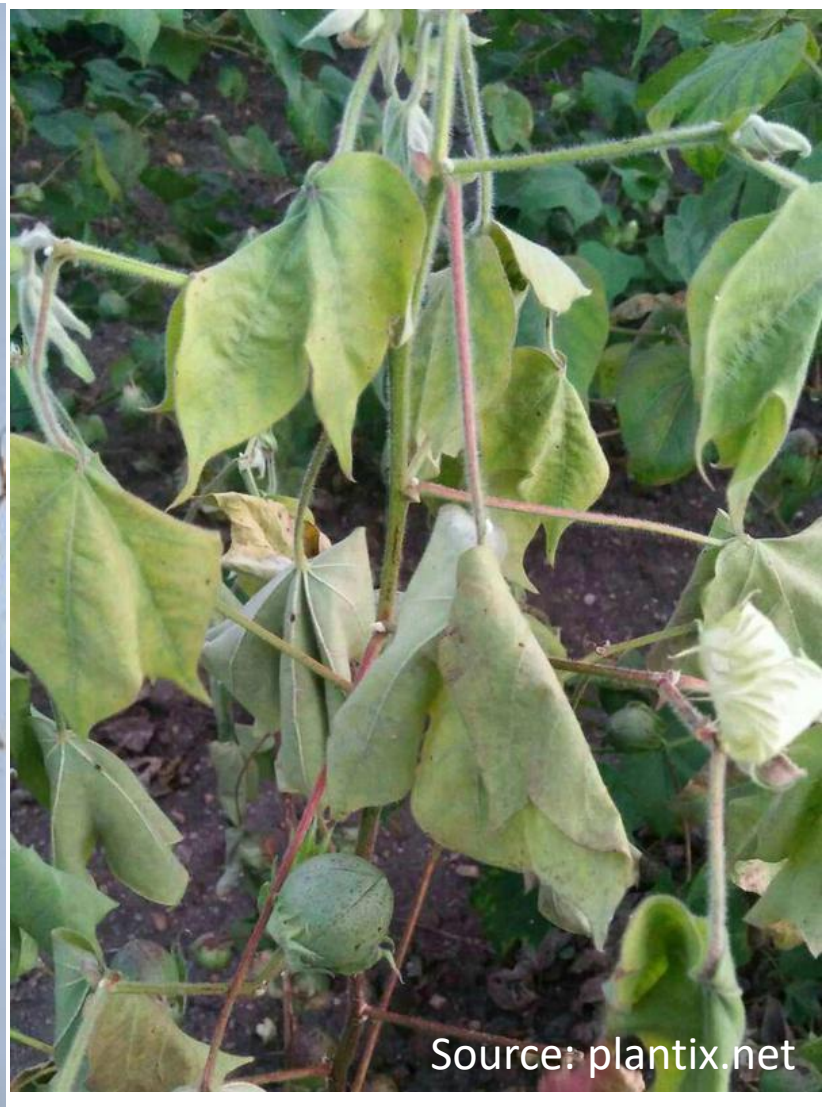


Root rot of dry beans – a disease complex caused by three common fungal pathogens

Difference in Symptoms		
Pythium	***Fusarium***	***Rhizoctonia***
Cause seed decay and seedling death	Seldom kills the plant	Cause seedling death, root and hypocotyl rot, stem cankers and pod rot
Scattered in a field with no pattern	Circular to irregular-shaped sectors within fields	Circular to irregular-shaped sectors within fields
Elongated water-soaked areas on hypocotyl and roots	Stunted and yellowed plants with reduced root systems, exhibit premature drop and poor pod fill	Linear or circular reddish- brown sunken lesions or canker delimited by a brown to reddish-brown margin

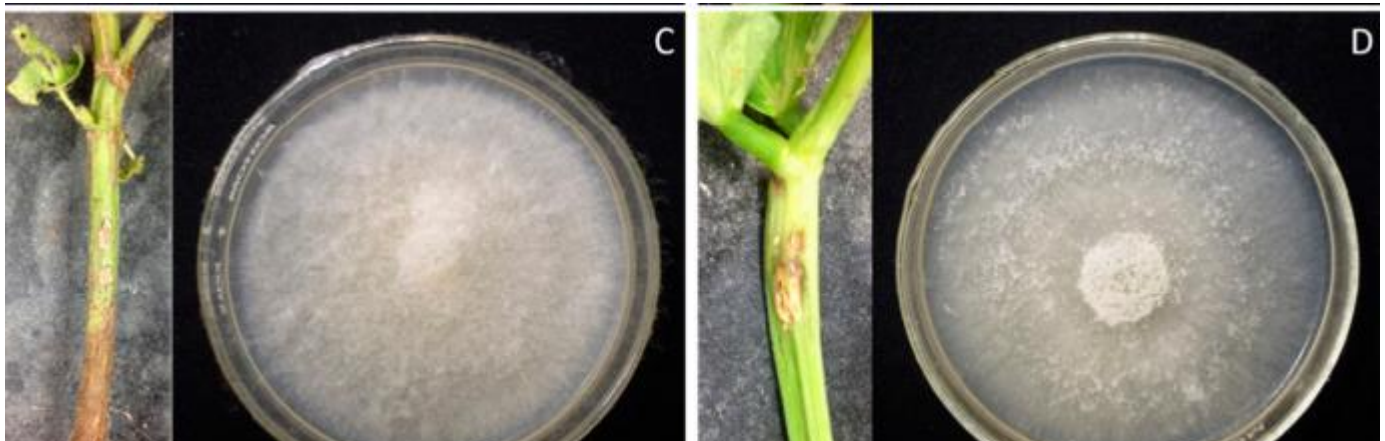
Symptoms of *Fusarium* in beans

Source: OSU, 2009



Source: plantix.net

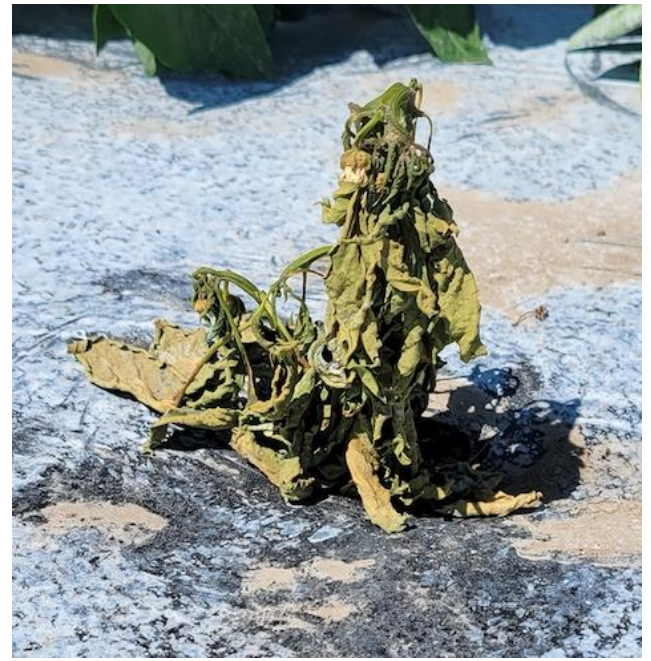
Symptoms of *Rhizoctonia* in beans



Symptoms in bell pepper

Pythium in bell pepper and beans late June 2021

- Bell pepper in Malheur County, OR
  - Dying or wilting
  - 50%+ incidence
  - Organic



- Dead black beans in Washington County
  - Dead bean plants
  - 25% + incidence

- Dead pinto bean plants Jerome county
  - 5% incidence
  - Scattered distribution

Pythium in bell pepper and beans late June 2021

- Bell pepper in Malheur County, OR
  - Dying or wilting
  - 50%+ incidence
  - Organic

- Dead black beans in Washington County
  - Dead bean plants
  - 25% + incidence

- Dead pinto bean plants Jerome county
  - 5% incidence
  - Scattered distribution

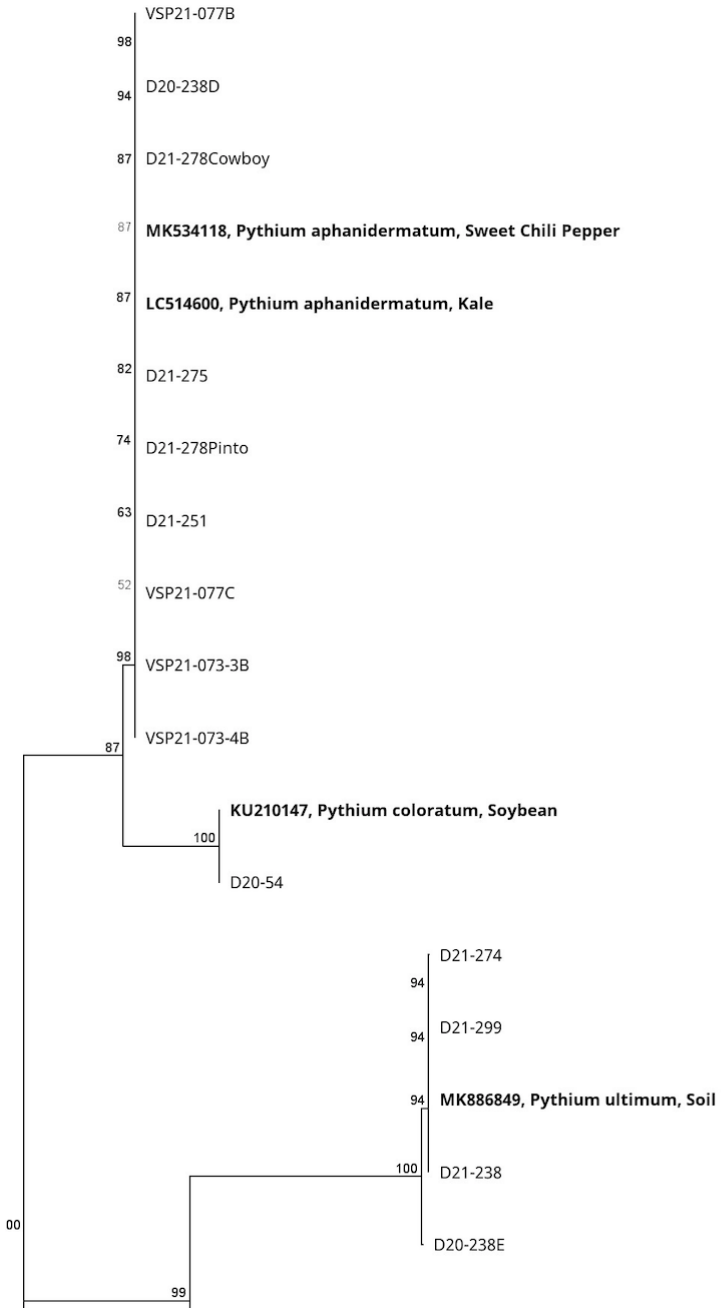
Methodology:

- Three *Pythium* isolates used
- Identification by sequencing

P. Intermedium (onion)

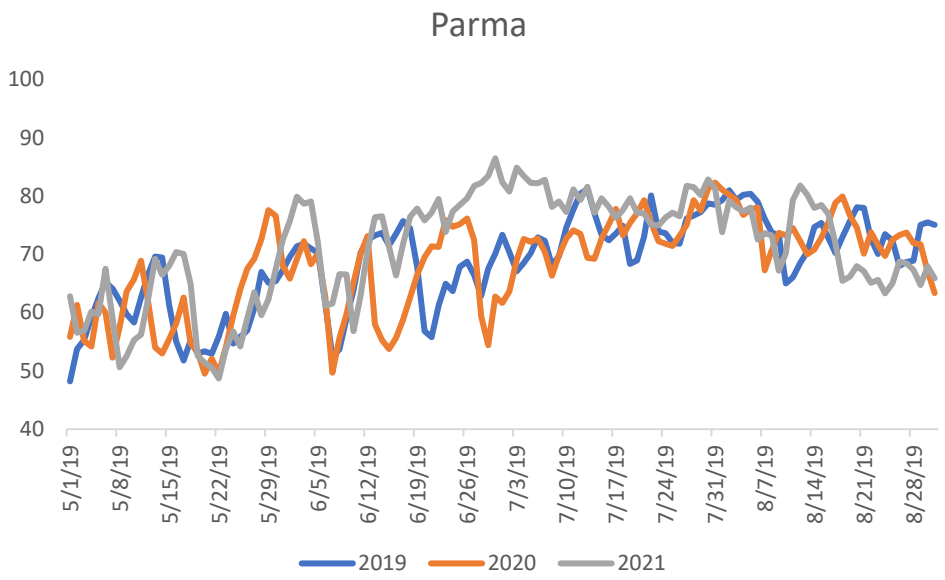
P. ultimum (pea)

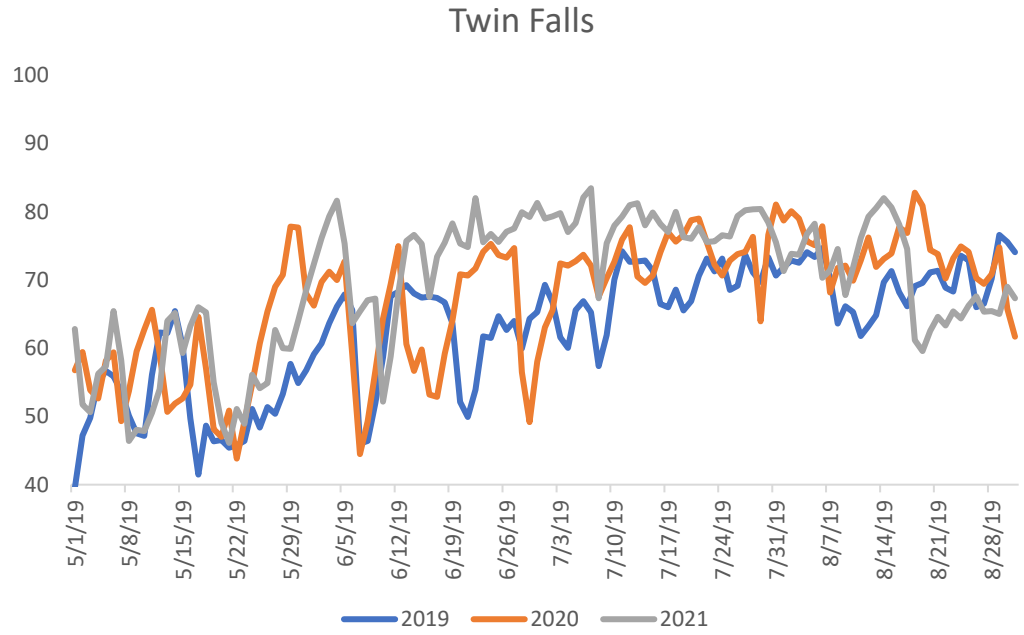
P. aphanidermatum (bell pepper)

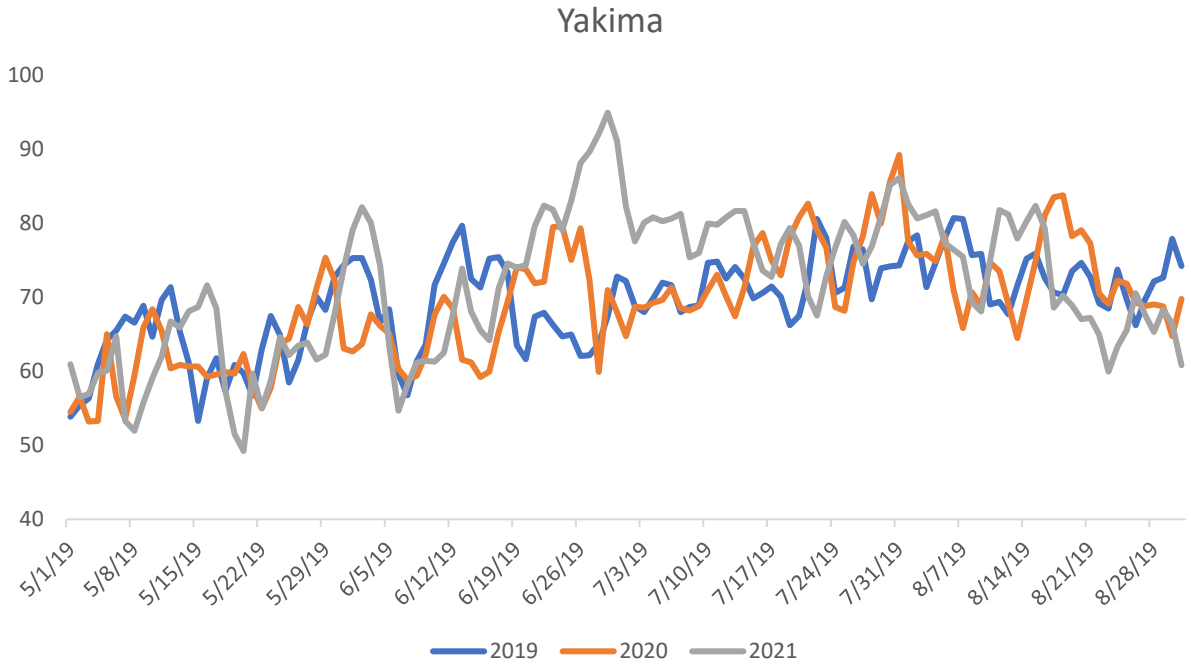


- Sequencing found all isolates were *Pythium aphanidermatum*
- Also found in 2021 in Yakima by WSU on spinach as a first record
- We usually encounter *Pythium ultimum*
- *P. ultimum*: 77-86°F
- *P. aphanidermatum* - 95°F

Mean daily air temperatures (F)







Rationale of the Study

Owing to the unusual hot temperatures in 2021, we studied the effect of three temperature regimes in the pathogenicity/virulence of three *Pythium* species on bell pepper, pinto bean and spinach under greenhouse conditions

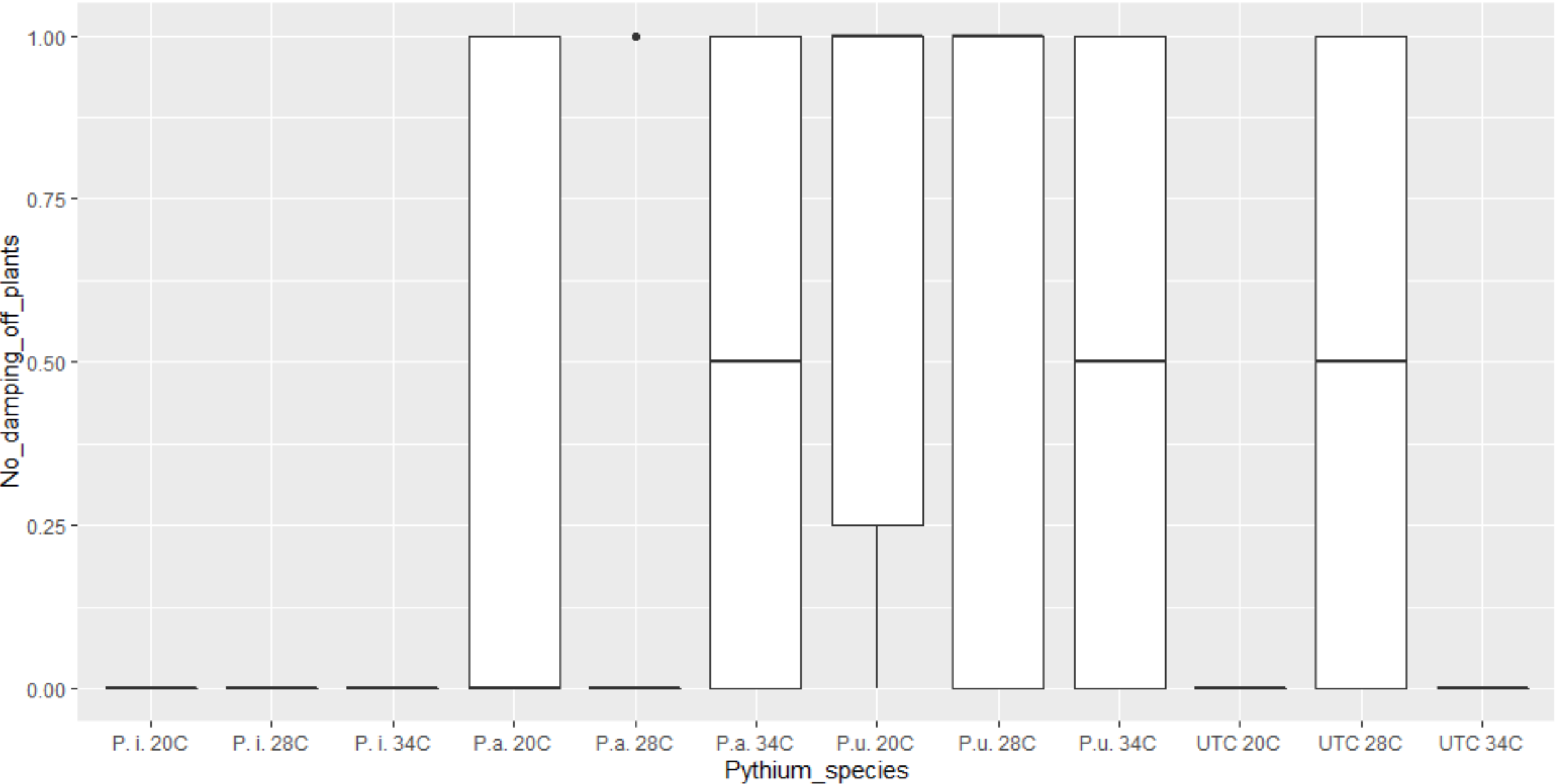
Methodology

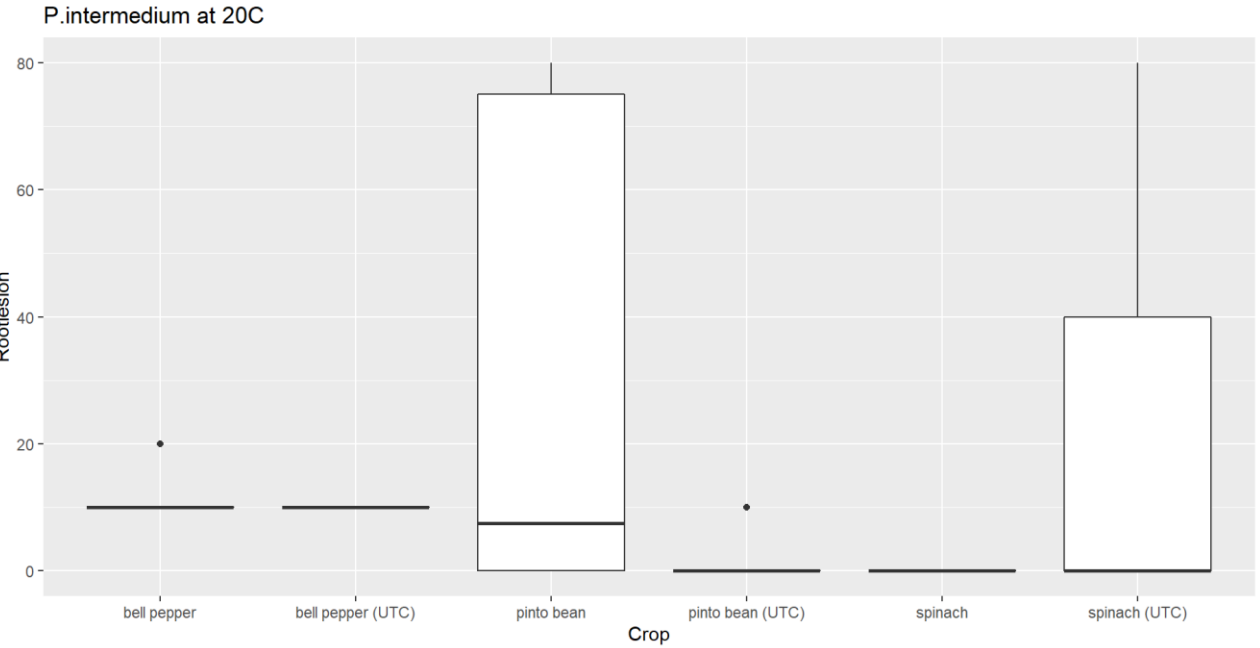
- Inoculation of 2-3-week-old sweet bell pepper (Huntington), pinto beans (Wind breaker) and spinach (Mandolin)
- Pots incubated in 20C, 28C and 34C heat mats
- Root and stem disease rating 4 weeks post inoculation
- Data Analysis

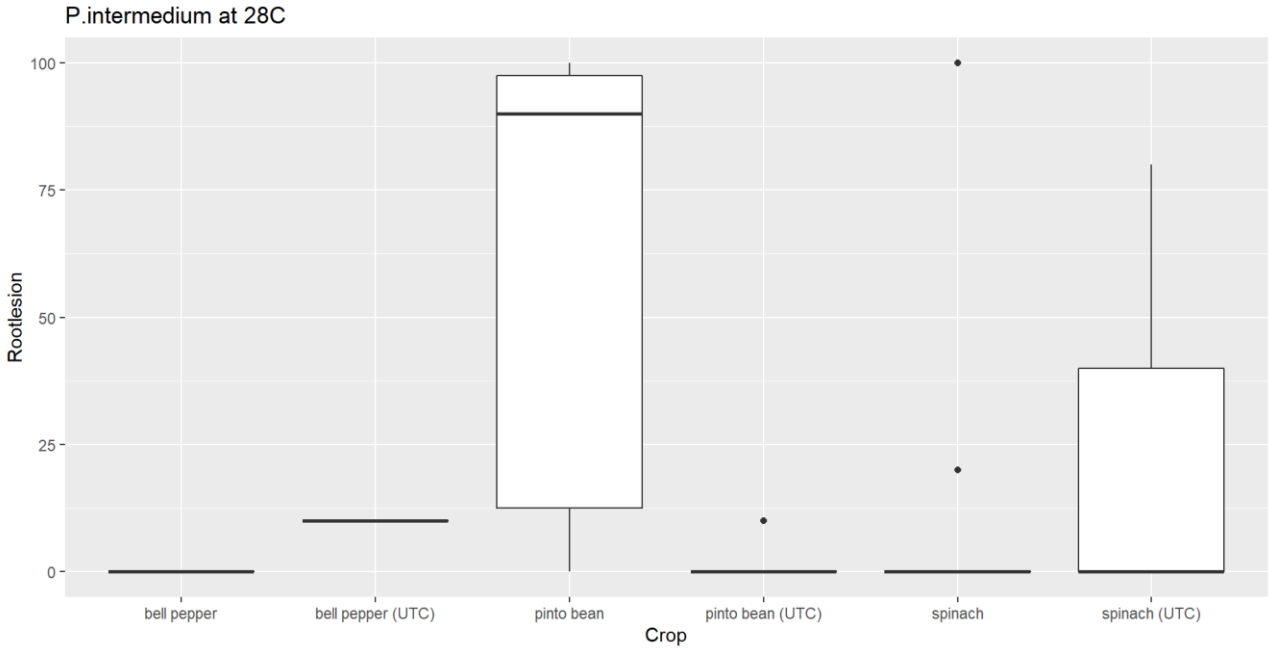
Bean Disease Rating (DR) - Key	
Roots DR	
0%	No disease
100%	Disease present
James' DR Stem	
0	Clean
1	Any lesion
2	Lesion above 5mm
3	Lesion above 10mm
4	Girdled lesion

Damping-off of seedlings caused by *P. aphanidermatum* and *P. ultimum* was only observed in spinach.

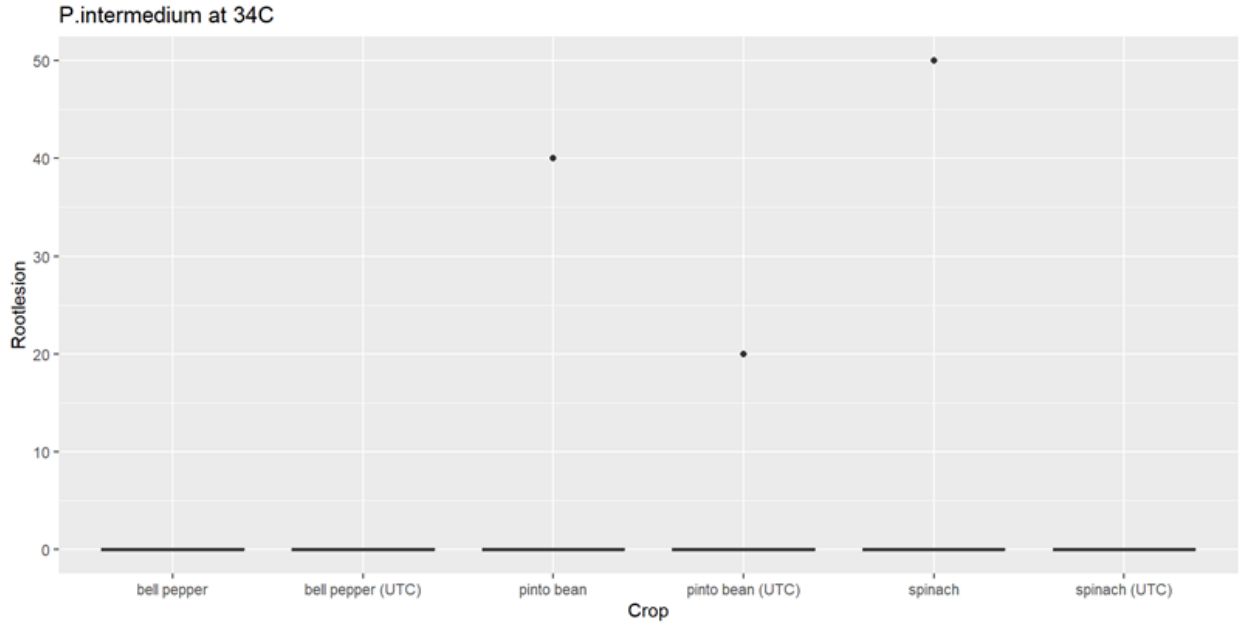
P. intermedium did not cause damping-off.

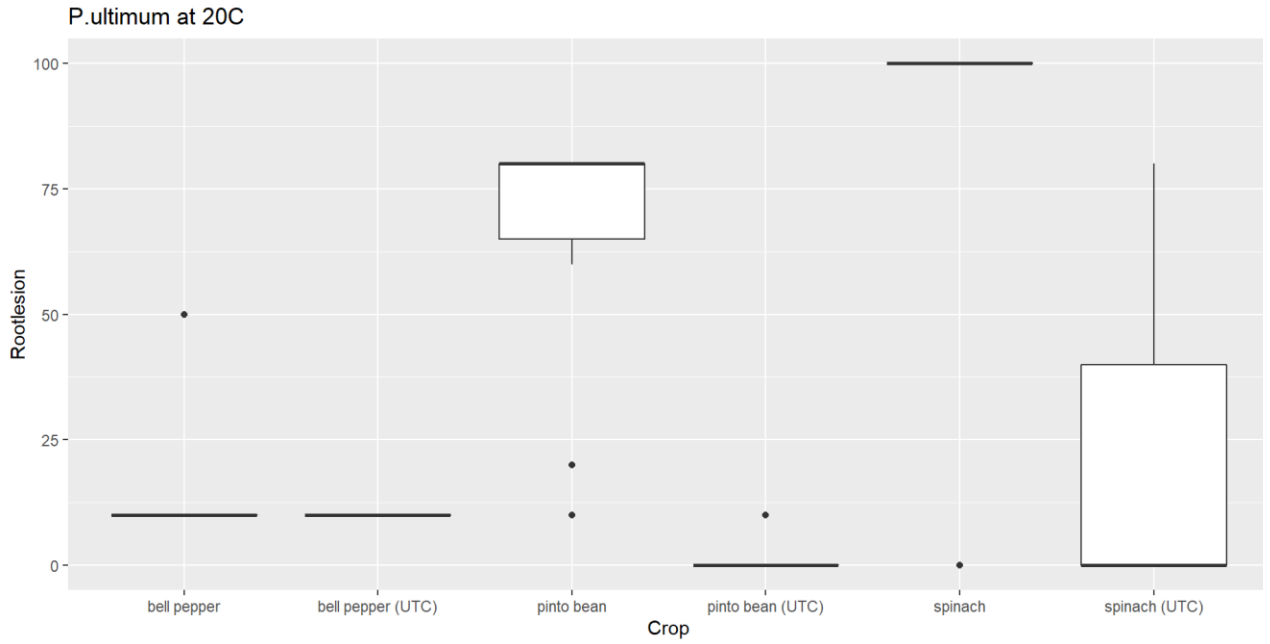


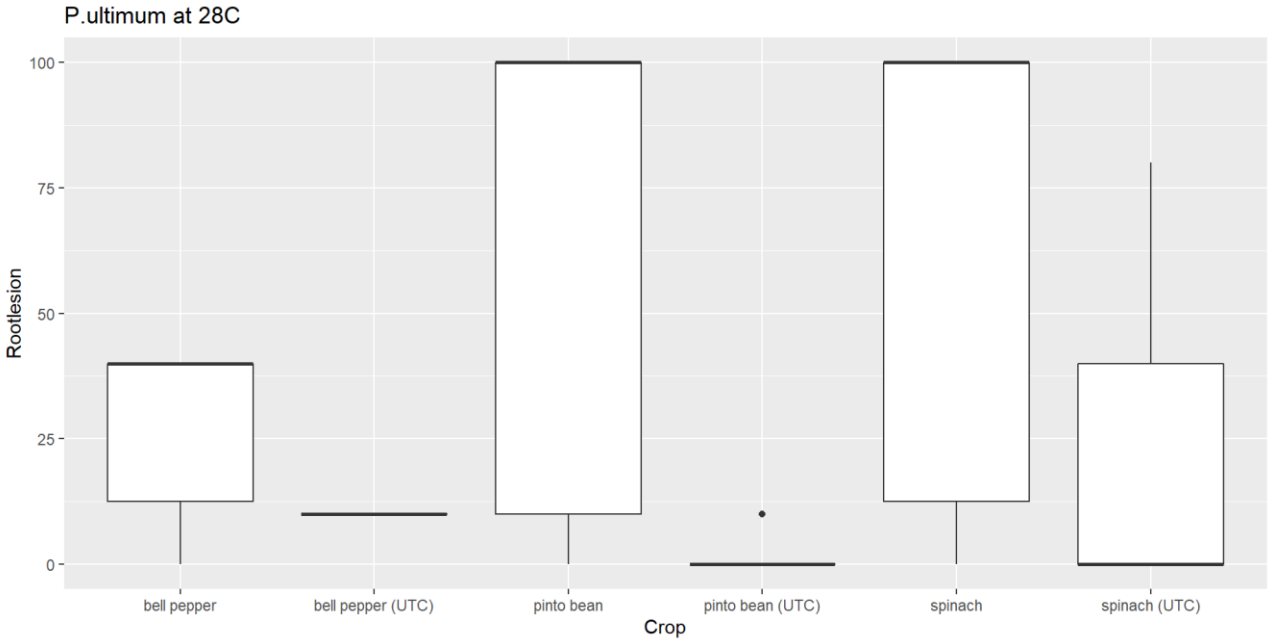




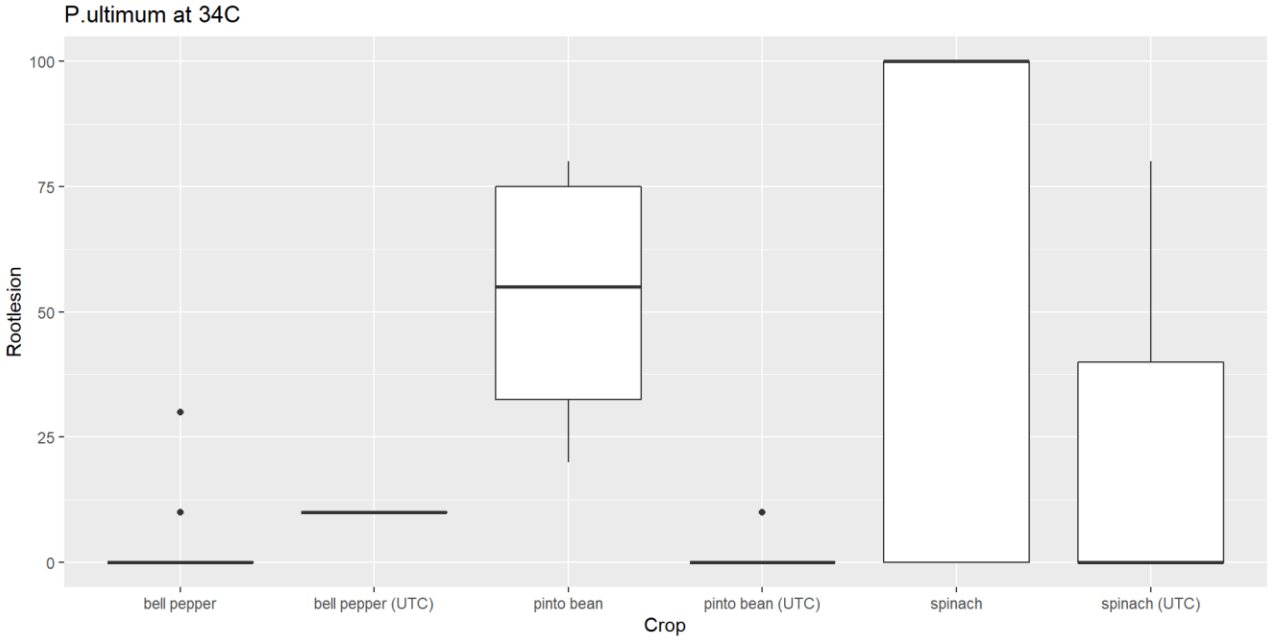
P. intermedium was pathogenic only on pinto beans at 20C-28C (68F-82.4F) and was non pathogenic at 34C (93.2F).

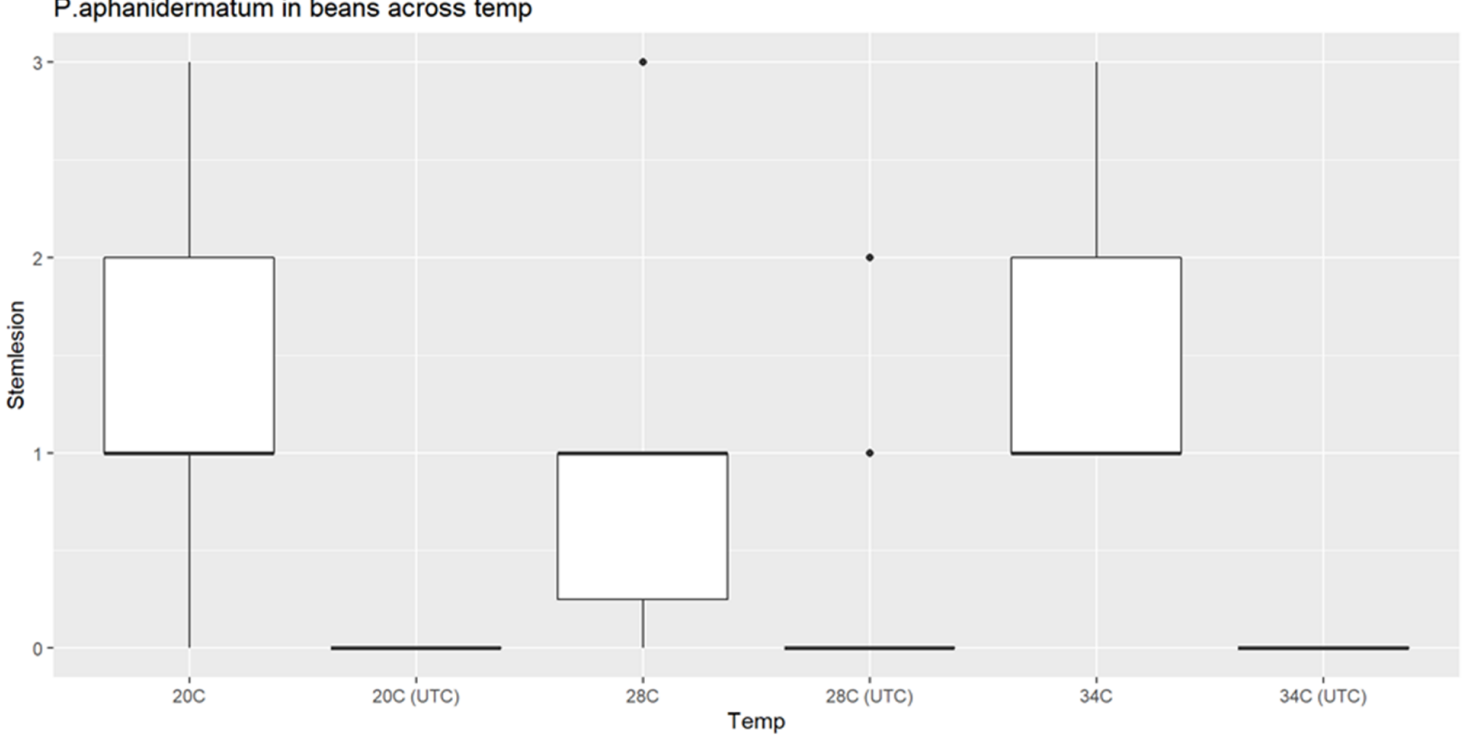




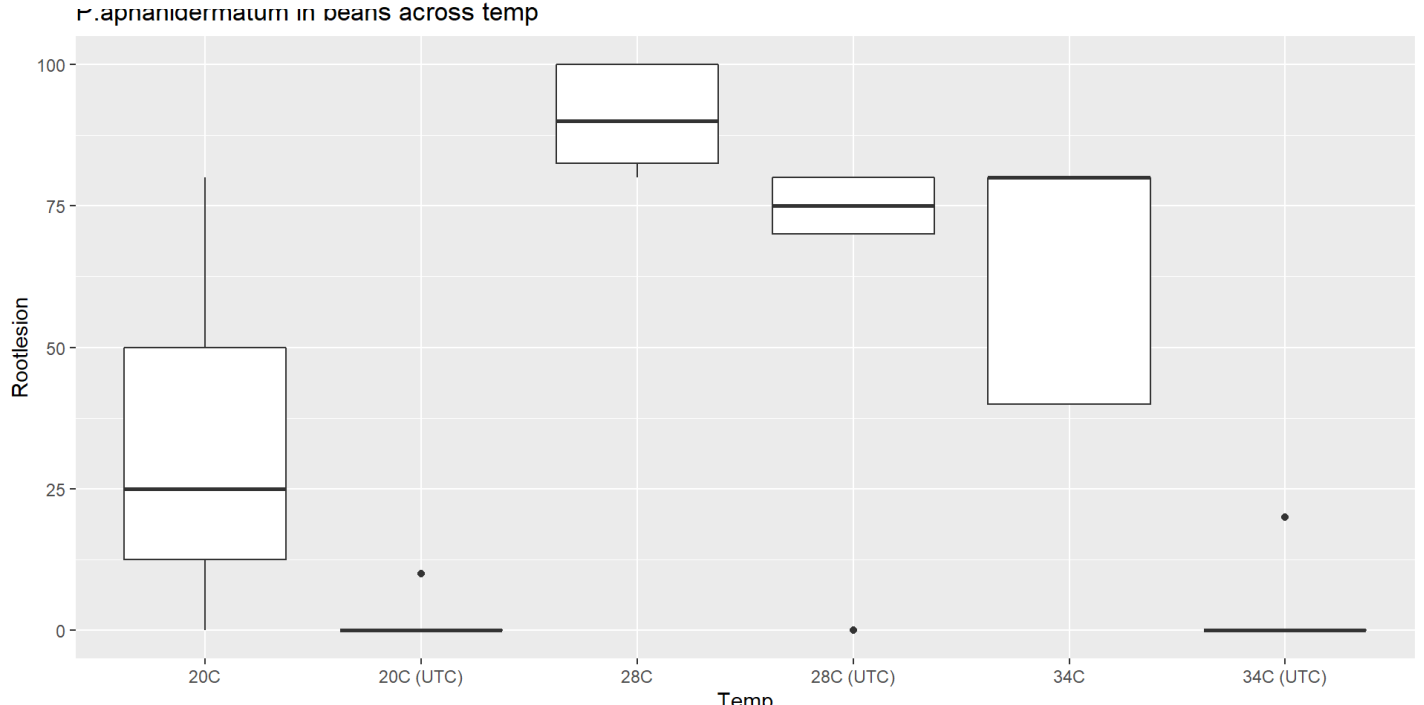


P. ultimum infected pinto beans at 20C-34C (68F-93.2F) but least virulent at 34C (93.2F) and most virulent on spinach in all temperatures.





P. aphanidermatum infected pinto beans at 20C-34C (64F-93.2F) and most virulent at 28C (82.4F).



Research Findings

1. *Pythium aphanidermatum* and *P. ultimum* were all pathogenic on bell pepper, pinto beans and spinach in all temperatures.
2. Damping-off of seedlings was only observed in spinach.
3. *P. intermedium* did not cause damping-off.
4. *P. intermedium* pathogenic only on pinto beans at 20C-28C (64.2-82.8F) and non-pathogenic at 34C (92.3F).
5. *P. ultimum* infected pinto beans at 20C to 34C (64F-92.3F) but least virulent at 34C (93.2F) and most virulent on spinach in all temperatures
6. *P. aphanidermatum* infected pinto beans at 20C-34C (64F to 92.3F) and most virulent at 28C (82.8F).
7. Temperature and host type have differential effects on disease severity caused by *Pythium* species.

Acknowledgements

- Dr. James Woodhall
- Chris Ballou
- Hayden Wood
- Ben Woods
- Lara Brown
- Mack Murdock